MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

PEM0026 – TRIGONOMETRY AND GEOMETRY

(Foundation in Engineering – All sections / Groups)

31 MAY 2016
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of 5 pages.

2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. All necessary working **MUST** be shown.

4. Only **NON-PROGRAMMABLE** calculator is allowed.

APPENDIX

TRIGONOMETRY IDENTITIES

$\sin^2\theta+\cos^2\theta=1$; $\sec^2\theta=1+\tan^2\theta$; $\csc^2\theta=1+\cot^2\theta$

$\sin 2\theta=2\sin\theta\cos\theta$

$\cos 2\theta=\cos^2\theta-\sin^2\theta=2\cos^2\theta-1=1-2\sin^2\theta$

$\tan 2\theta=\dfrac{2\tan\theta}{1-\tan^2\theta}$

$\sin(A\pm B)=\sin A\cos B\pm\cos A\sin B$

$\cos(A\pm B)=\cos A\cos B\mp\sin A\sin B$

$\tan(A\pm B)=\dfrac{\tan A\pm\tan B}{1\mp\tan A\tan B}$

$2\sin A\cos B=\sin(A+B)+\sin(A-B)$

$2\cos A\cos B=\cos(A+B)+\cos(A-B)$

$2\sin A\sin B=\cos(A-B)-\cos(A+B)$

$\sin A+\sin B=2\sin\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$; $\sin A-\sin B=2\cos\dfrac{A+B}{2}\sin\dfrac{A-B}{2}$

$\cos A+\cos B=2\cos\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$; $\cos A-\cos B=-2\sin\dfrac{A+B}{2}\sin\dfrac{A-B}{2}$

$\sin^2\dfrac{A}{2}=\dfrac{1-\cos A}{2}$; $\cos^2\dfrac{A}{2}=\dfrac{1+\cos A}{2}$; $\tan^2\dfrac{A}{2}=\dfrac{1-\cos A}{1+\cos A}$

$\sin\dfrac{A}{2}=\pm\sqrt{\dfrac{1-\cos A}{2}}$; $\cos\dfrac{A}{2}=\pm\sqrt{\dfrac{1+\cos A}{2}}$; $\tan\dfrac{A}{2}=\pm\sqrt{\dfrac{1-\cos A}{1+\cos A}}=\dfrac{1-\cos A}{\sin A}=\dfrac{\sin A}{1+\cos A}$

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QUESTION 1 [25 marks]

a. Given that $\cos\theta = \frac{3}{7}$ and $\sin\theta < 0$, find the exact value of the remaining trigonometric functions of θ.

[7 marks]

b. Simplify $11\csc\left(\frac{\pi}{2}+x\right)\csc\left(\frac{\pi}{2}-x\right)+11(-\tan x)\cot\left(\frac{\pi}{2}-x\right)$.

[6 marks]

c. Refer to Figure Q1, A and B are 2 points on a circle with center at O and radius 10cm. Angle $AOB = \alpha$ and the length of the chord AB is 12cm.

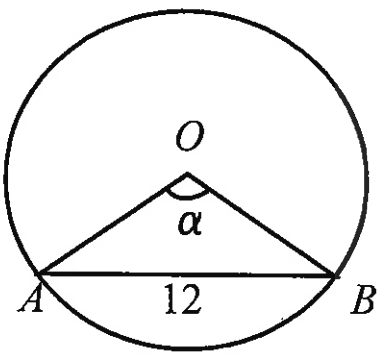

Figure Q1

i. Find α in radian. (2 marks)

ii. Find the area of minor segment bounded by AB and the circle. (6 marks)

d. Sketch the following function, $f(x)=\sin(2x+\frac{\pi}{2})+\frac{1}{2}$.

[4 marks]

Continued...

QUESTION 2 [25 marks]

a. Verify that $\frac{\sin x}{1+\cos x}+\frac{1+\cos x}{\sin x}=2\csc x$.

[6 marks]

b. Given that $\theta=\cos^{-1}\left(\frac{\sqrt{2}}{\sqrt{u^2+2}}\right)$, write $\sin\theta$ and $\tan\theta$ as an algebraic expression in u.

[6 marks]

c. Suppose that α and β are angles in standard position, with $\alpha=\sin^{-1}\left(\frac{2}{3}\right)$, $0\le\alpha\le\frac{\pi}{2}$, and $\beta=\tan^{-1}\left(-\frac{3}{4}\right)$, $-\frac{\pi}{2}\le\beta\le 0$. Find $\cos(\alpha+\beta)$.

[5 marks]

d. Solve the equation $\cos(2x)+\sin x=0$ over the interval of $0\le x\le 2\pi$.

[8 marks]

Continued...

QUESTION 3 [25 marks]

a. If $z = 4(\cos 35^\circ + i \sin 35^\circ)$ and $w = 2(\cos 80^\circ + i \sin 80^\circ)$. Find the following and leave your answer in polar form.

i. zw

ii. $\frac{z}{w}$.

[4 + 4 marks]

b. State the De Moivre's theorem and write $(2+2i)^6$ in standard form $a + bi$.

[6 marks]

c. Given point $A(-3,-2)$, point $B(4,-5)$ and two vectors, $\mathbf{m} = 2\mathbf{i} + 3\mathbf{j}$, $\mathbf{n} = -\mathbf{i} + 3\mathbf{j}$, respectively. Find the values of u and v, if $\vec{AB} = u\mathbf{m} + v\mathbf{n}$ where u and v are constants.

[11 marks]

QUESTION 4 [25 marks]

a. Find an equation of the parabola with vertex at (–2, 3) and focus at (0, 3). Graph the equation.

[10 marks]

b. Find an equation of the ellipse with center at the origin, one focus at (3, 0) and a vertex at (– 4, 0). Graph the equation.

[10 marks]

c. Find an equation of the hyperbola with center at the origin, one focus at (3, 0), and one vertex at (–2, 0). Graph the equation.

[5 marks]

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